The P42 + K12 beam lines for NA62

This beam line, derived from the T4 primary target and serving the
NA62 experiment in ECN3, is about 1.1 km long and consists of 2 parts:

- ❑ The **P42** primary proton beam from T4 to the T10 target (~840 m)
- ❑ The **K12** beam from T10 to the experiment (~260 m)

The P42 beam settings are expected to be rather stable throughout the year,
apart from the fine steering onto the 2 mm diameter T10 target

However, there will be 'frequent' changes in the K12 beam.

Please note that the P42 and K12 beams will only start operation on September 11th!

27-Feb-2008   **2008 SPS Fixed Target Programme**   Version 1.0

Colour code: blue (dark shading) = not yet allocated ; yellow (light shading) = not allocatable or Machine Development

|	P1	P2	P3	P4	P5	P6
	24	28	35	28	28	34
	19 May	12 Jun	10 Jul	14 Aug	11 Sep	9 Oct
	12 Jun	10 Jul	14 Aug	11 Sep	9 Oct	12 Nov
T4 -P0	EA 3 / 13	28	35	28	NA62 13 / 8	NA62 7 / NA62 10 / 7	NA62 17

Physics   Straw R&D   RICH R&D

P42 specials:

P42 provides 'simply' proton transport from T4 to the T10 target

❑ Magnet currents are tuned and kept updated in the P42 beam file
  Only Trims 9 and 10 are regularly tuned (wobbling!) to steer onto T10

❑ Due to high intensities, the use of collimators is forbidden!

❑ The control of T10 flux is 'only' possible by
  - changing TAX hole (= position) in the P42 TAXes (discrete changes only)
  - changing the intensity onto T4 (any value, but somewhat tedious…)
  - changing the T4 target head (affects H6, H8 – needs EA physicists)

❑ As the intensity is high ($1.5 \ 10^{12}$ on T10 target), the currents of the main bends
  in P42, as well as some currents in K12 are monitored by **P0-SURVEY**

❑ The cooling of the T10 target and TAX are monitored by **DUMP CONTROL**

❑ The access to ECN3 and galleries also requires to close the P6 TAXes

**Never disable P0 survey or DUMP control without
prior agreement of the responsible EA physicist!**
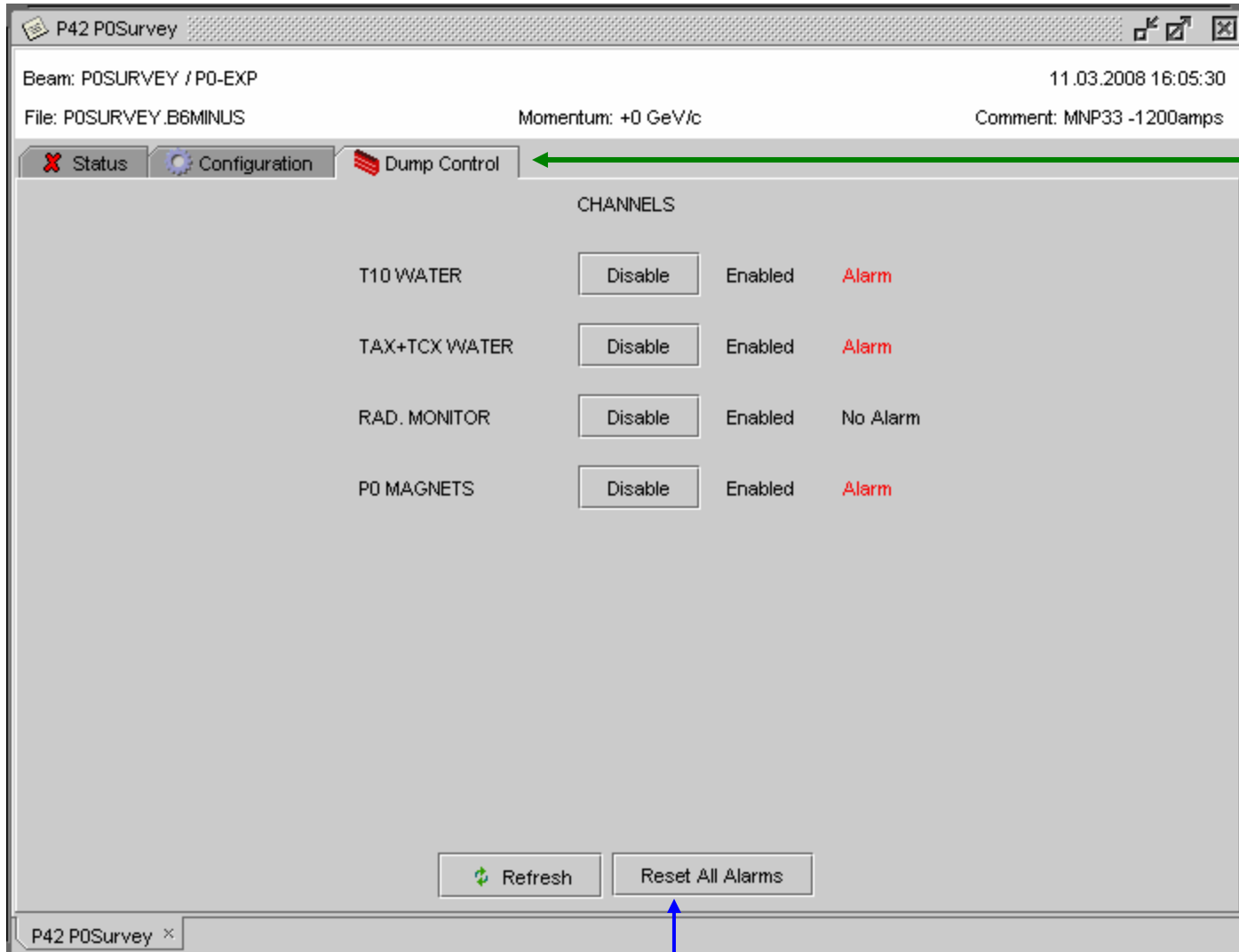
Examples of P42 **Trim scans**:
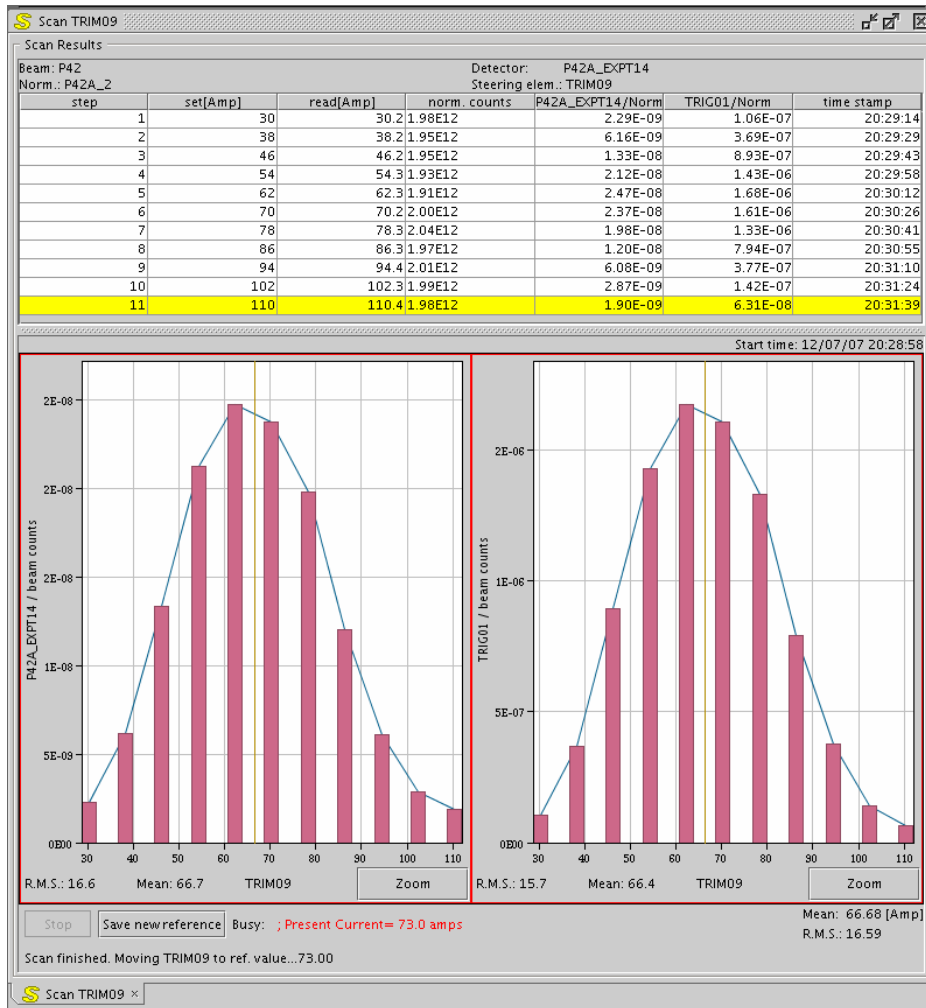
P42-TRIM9 scan
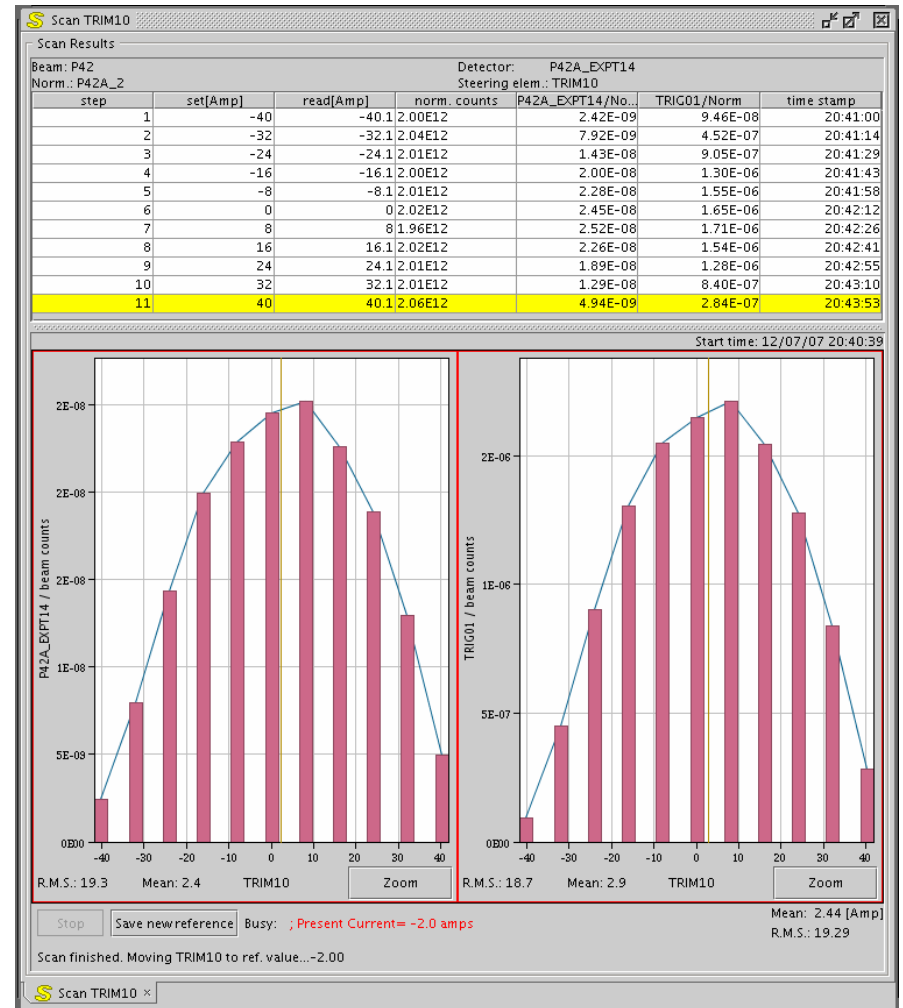
P42-TRIM10 scan

Via EA / **P0Surve**y menu, only in P42 workspace:

DMPC tab

**Note:
Status TABs
opens window
where magnets
in fault are
highlighted
in red**

Possibility to reset alarm, once the problem has been fixed

P42 P0Survey

Beam: P0SURVEY / P0-EXP   11.03.2008 16:05:30

File: P0SURVEY.B6MINUS   Momentum: +0 GeV/c   Comment: MNP33 -1200amps

| ✗ Status | ○ Configuration | Dump Control |

Choose configuration file : **P0SURVEY.B6MINUS** ▼   ☐ Enable All Magnets

Magnet Name	Beam Ref. Current	P0 Sur. Current	Tolerance	Enabled
P42-BEND02	-199	402	1	✔
P42-BEND03	-580	1,160.6	1	✔
P42-BEND04	-443.8	891.1	1	✔
P42-BEND05	-440	891	1	✔
P42-BEND06	0	0	1	✔
P42-BEND07	551.4	-1,109	1	✔
P42-BEND08	634.2	-1,322.8	1	✔
P42-BEND09	-248.2	496.2	1	✔
P42-BEND10	900	-1,209.2	1	✔
P42-BEND11	0	-1,209.2	1	✔
P42-BEND12	0	-858.8	1	✔
K12-BEND01	591.8	591.8	1	✔
K12-BEND02	-608.2	-602.8	1	✔
K12-BEND03	20	7.5	1	✔
K12-BEND04	-381.6	-381.6	1	✔
K12-BEND05	381.6	381.6	1	✔
K12-BEND06	0	-1,200	30	✔
K12-TRIM03	0	26	3	✔

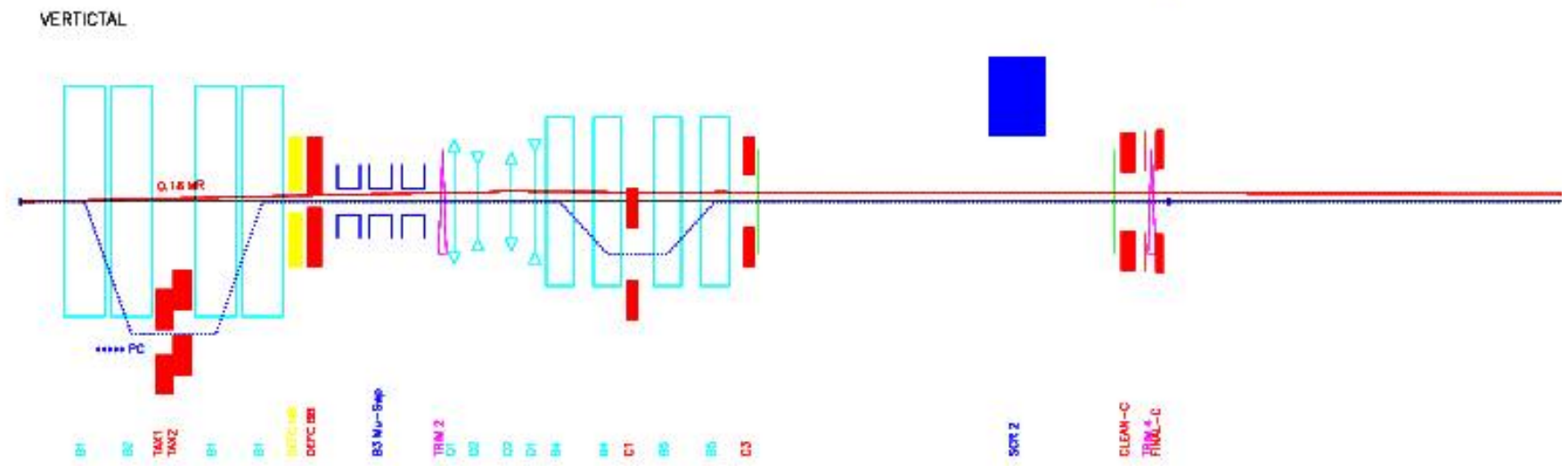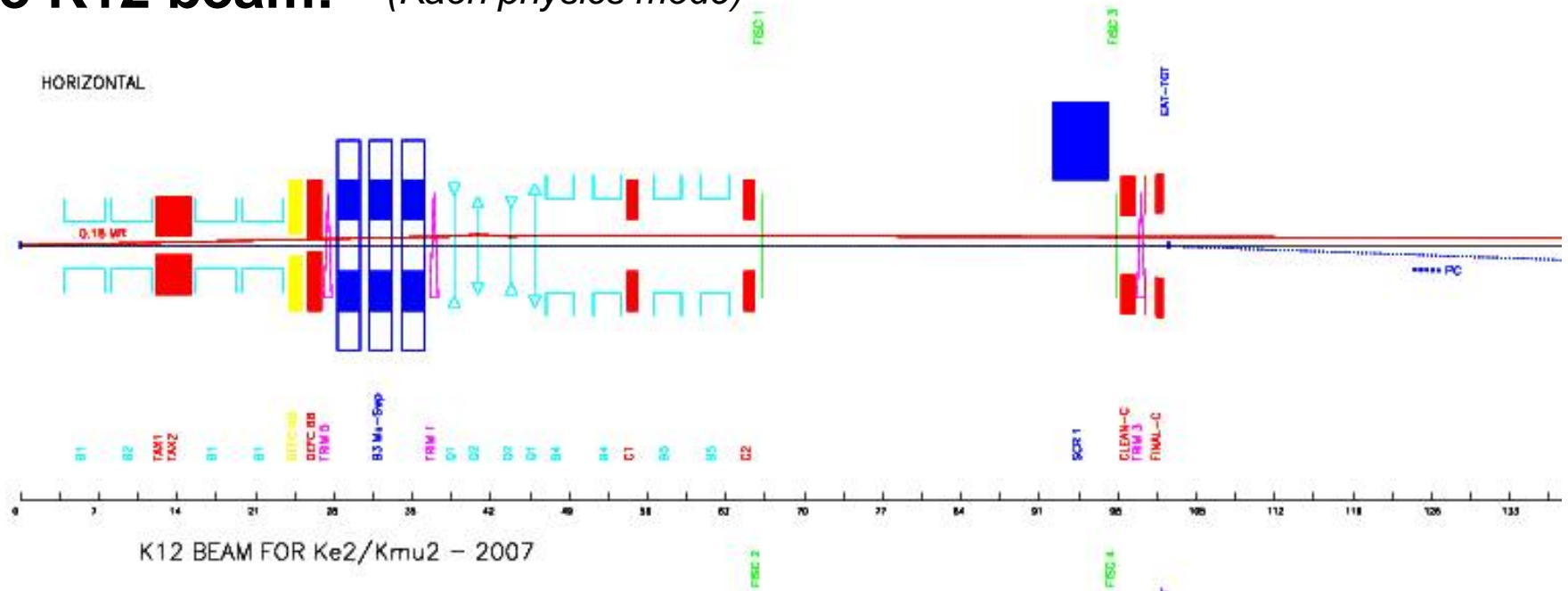| ✗ Delete | 🗐 Copy BeamRef to P0Survey | 🇫 Save As | 💾 Save | Send to equipment |

P42 P0Survey ✕

Config tab

Choose surveillance reference file corresponding to beam file in use

To activate new survey references

Normally only changed by EA physicists

The K12 beam: *(Kaon physics mode)*

HORIZONTAL

K12 BEAM FOR Ke2/Kmu2 – 2007

VERTICTAL

The K12 beam line can be operated in several modes:

❑ K$^+$ or K$^-$ or simultaneous K$^+$ + K$^-$ beams (typically ±75 GeV/c)

This is the typical condition for physics operation

Two 'achromats' with momentum selection in K12 TAX

Muon sweeping with Bend3 ('filled' with Iron) and scrapers

❑ Muon beams

Dump the beam from T10 in the K12 TAX

Switch muons sweepers, quadrupoles, trims and 2nd achromat off

❑ Low energy secondary beams for straw detectors

40 GeV selected instead of 75 GeV,

deflected away from beam (by 15 cm!) axis with Trim-3 (as in 2007)

❑ Low-energy secondary PARALLEL beams for RICH prototype

typically around 30 GeV. Special beam optics. NEW FOR 2008.

Changes between these modes are done by EA physicist
They involve beam files, K12 TAX positions, P0-survey

K12 Specials:

K12-TAX2

200 mm

40 mm

K12-TAX1

❑ The **K12 TAX** are special:
   they have two race-track slits
   that can be offset to define
   one or two momentum slits
   or on hole on the central axis

❑ Bends 6 and 7 control the two
   coupled pairs of coils of the **MNP33 spectrometer**.
   They are operated only via a special program EA → MNP33 in the K12 beam

❑ Three special **XCLD collimators** allow to define the angular acceptance of
   the beam line. They are solid blocks with a fixed dimension hole.
   They can be moved IN and OUT of the beam.
   When IN, they can be positioned finely in both planes (range ±4 mm)
   Please do not move without consulting the EA physicist!
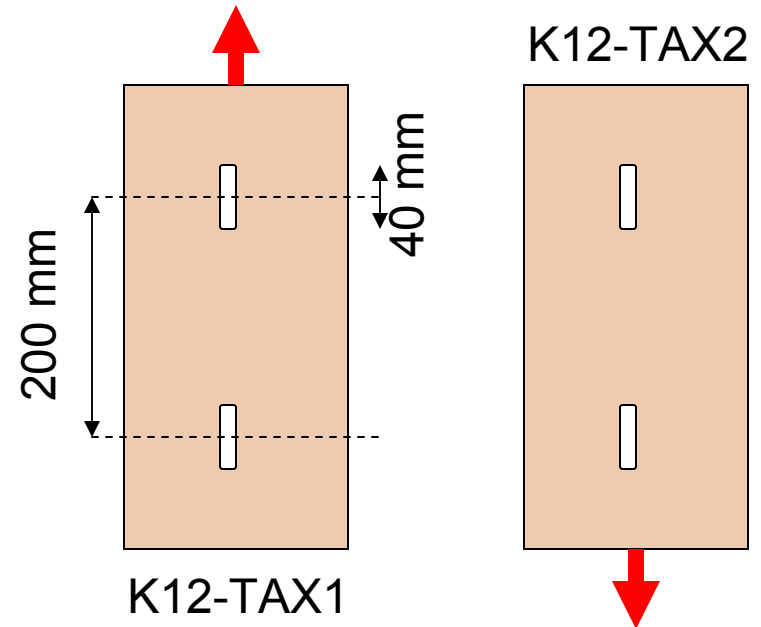
❑ **Access to ECN3** cuts 4 TAX and 3 rectifiers.

A reset of P0-survey is thus necessary after end of access.

Normally this is done automatically by the access program.

❑ The **technical gallery G300** access requires ' small range' on P42-TAX2

This is monitored by a EA-SIS program.

If the position or range changes during an access, P42-TAX2 is closed !

❑ **If P42-TAX2 does not open beyond +44 mm**, the range is blocked (most likely due to the user not having pushed " End of Access" button after a access to G300).

Change the TAX to medium or large range once the G300 access has ended

More details under K12 from the ATB-SBA home page and in the Wiki pages.